

# PATENT SPECIFICATION

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## (54) PROCESS FOR PRODUCTION OF A SYNTHETIC PAPER IMPROVED AGAINST DUSTING TROUBLE

(71) We, OJI YUKA GOSEISHI KABUSHIKI KAISHA, a Japanese company of 5—2, Marunouchi, 2-chome, Chiyoda-ku, Tokyo-To, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a process for the production of a synthetic paper which is substantially free of dusting trouble. In particular, it is concerned with a process for the production of a synthetic paper having improved continuous printability, especially continuous offset printability.

Instead of cellulosic paper consisting of entangled cellulose fibres, various synthetic papers produced by paper-making synthetic resin films have been proposed. Among such synthetic papers is one comprising a paperlike layer consisting of a stretched film of a resin having fillers incorporated therein. The synthetic paper of this type may be composed of either a single layer structure composed of only a paperlike layer, or a laminate structure composed of a substrate layer with the paperlike layer coated on at least one of the surfaces thereof (see, Japanese Patent Publication No. 40794/71 and British Paper Specification No. 1330510).

Good paper properties of such a synthetic paper comprising a paperlike layer consisting of a stretched film of a resin having fillers incorporated therein can be attributed to the presence of microvoids throughout the film which develop around the filler particles. The

microvoids are uniformly distributed throughout the depth of the paperlike layer, and those present on or near the surface of the paperlike layer are open to the outside of the surface of the layer. The communication of the surface microvoids with the outside and the presence of exposed filler particles on the surface are due to stretching of a film of a resin having the filler incorporated therein. These characteristics enable this type of synthetic paper to possess properties such as good quality paper, printability or ink-receiving capacity and ink-drying property.

However, this feature of the surface microvoids presents a problem. That is, the filler particles exposed on the surface of the paperlike layer may come off the surface which results in an adverse effect on printing working.

This problem is evident in a continuous printing. In particular, in offset printing when ink is transferred on to the paper from a blanket roll, the unstable or exposed filler particles on the surface thereof come off due to the high pressure applied thereon and adhere to the blanket roll. The weak surface layer will also come off. These factors reduce printing workability, which in turn leads to an increase in cost and damage to the printing uniformity of the print produced. While being not so remarkable as in offset printing, this problem also arises in both relief printing and intaglio printing.

Problems caused by the occurrence of the fallen fines or "paper dust" from such a synthetic paper, or dusting trouble, are usually observed during printing, and with regard to

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cellulosic paper, paper manufacturers and printers have made various studies to overcome these problems.

Because of the advantage of synthetic paper comprising a paperlike layer consisting of a stretched film of a resin having filler particles incorporated therein, a solution to prevent dusting trouble in this case is also desired. Suitable means intended for cellulosic papers, however, is not necessarily applicable to the above-mentioned synthetic paper. For instance, as for a means comprising applying a polymeric coating material, when the polymer used is a styrene/maleic acid copolymer the "paper dust" is strongly fixed on the paper, while the drying property of ink remarkably deteriorates; when polyvinyl alcohol is used as the polymer in place of the styrene/maleic copolymer, fixation of the paper dust is poor and ink transference deteriorates; when polyethylene imine is used as the polymer, fixation of the paper dust is appreciably satisfactory, while film properties (such as texture as a paper, stickiness) are poor; and when natural products such as starch are used both fixation of the paper dust and adhesion thereof to the surface of the paper are poor.

Generally, when a polymeric coating material is applied on the synthetic paper comprising a paperlike layer consisting of a stretched film of resin having filler particles incorporated therein, the resulting adhesion is frequently poor in itself because of the stretched condition of the paperlike layer and dependence of the type of the resin. It is particularly poor when the resin is an olefin polymer. Thus, in order to prevent the occurrence of problems caused by the poor adhesion of the dope material in the secondary processing of the coated paper, particular polymeric coating materials should be selected.

This problem can be solved by coating with an aqueous solution of an acrylamide compound polymer. Thus, these polymers are substantially free of the above-mentioned disadvantages, and since they are further used in the form of an aqueous solution there is no danger of changes in the quality of the usually hydrophobic synthetic paper (for example, curl and shrinkage), toxicity and fire in the synthetic paper to be treated as is often the case with organic solvents.

However, as this prior method includes the use of a water-soluble polymer as a polymeric coating material the resulting paper is poor in water-proofness, and the print produced is limited in its use and is unsatisfactory for practical use.

The problem of the reduction in water-proofness due to the coating material may be overcome by using an aqueous emulsion of a water insoluble polymer. However, in this case a surface active agent used for emulsification

causes detrimental effects such as bleeding and reduction in ink transference.

As a means for overcoming the problem of water-proofness while maintaining the advantage of an aqueous system the use of phenol-formaldehyde condensation products and aminoplast condensation products may be proposed. However, these materials have the disadvantage that they must be cured by heating. Since the synthetic paper to be treated is composed of stretched films, heating temperatures should be limited within a certain range from the standpoints of dimensional stability of the films so as to prevent shrinkage or curl from occurring in the synthetic paper. This is the same with other thermosetting resins such as epoxy resins.

Although the layer of the polymeric coating material must be very thin (for example the coverage is in the range of from 0.1 to 1 g/m<sup>2</sup> on the basis of the coating material), it is not always easy to provide a thin and uniform coating of an aqueous solution of a paste polymer on a paperlike layer. That is, the formation of a uniform and thin layer is essentially difficult and, further, because of the hydrophobic nature of the paperlike layer, a resin such as an olefin polymer in a aqueous solution of a polymeric coating material is repelled and a uniform and thin layer is difficult to form.

It is an object of the present invention to remove the abovementioned disadvantages and to provide a synthetic paper which consists of a stretched film of a resin having filler particles incorporated therein and which is improved against the dusting trouble.

These objects can be accomplished according to the present invention which provides a process for producing a synthetic paper comprising:

- (a) coating the surface of a sheet comprising a layer of a plastics material having filler particles having a size of from 0.5 to 30 microns incorporated therein with an aqueous dispersion or solution of a dry-extensible polymeric coating material, said sheet comprising the plastics layer alone or a laminate of the plastics layer and at least one further layer of plastics;
- (b) drying the coated sheet; and
- (c) stretching said sheet in at least one direction to form an opaque paper-like structure.

In this way, notwithstanding that the present invention enjoys the advantage of using a polymeric coating material in the form of an aqueous dispersion or an aqueous emulsion, the present invention has succeeded in eliminating the above-mentioned problems encountered in the prior art, i.e. poor water-proofness and bad adhesion to the paperlike layer.

The present invention enables the use of a polymeric coating material such as a styrene-maleic acid copolymer which was heretofore excellent in fixation of the paper dust while unsatisfactory in other respects of some other polymeric coating material such as polyvinyl-alcohol which was heretofore poor in fixation of the paper dust.

In accordance with the present invention, the polymeric coating material is subjected to a stretching operation, whereby it is reduced in thickness and the original thickness of the polymeric coating material before stretching may be thus relatively thick. The formation of a relatively thick coating material layer and the control of its thickness may be easily carried out.

The synthetic paper which is subjected to the surface treatment according to the present invention is greatly improved in continuous offset printability and has improved gloss, smoothness and surface strength and further provides improved ink trapping in continuous offset printing (four- or two-colour machine) and weather resistance in offset printing. In addition, the synthetic paper treated according to the present invention is better in ink trapping, adhesion between the coating material and the substrate paper, texture and smell than the synthetic paper coated with a polymeric coating material after stretching. It is considered that such advantageous properties can be attributed to the fact that stretching of the polymeric coating material together with the paperlike layer provides a great improvement in the adhesion between the polymeric coating material and the surface of the paperlike layer.

A stretched film of a resin having filler particles incorporated therein is utilized as the paperlike layer in the synthetic paper of the present invention.

One class of such synthetic paper consists of synthetic paper having a single layer structure which is composed of uniaxially or biaxially stretched resin film having fine filler particles incorporated therein.

Another class thereof consists of synthetic paper of a laminate structure which is composed of such a stretched paperlike layer laminated onto at least one surface of a substrate layer. The typical synthetic paper of such a laminate structure is one in which the paperlike layer is uniaxially stretched and the substrate layer is biaxially stretched. This type of synthetic paper can be prepared by extruding a resin having filler particles incorporated therein on at least one surface of substrate film of a resin which has been longitudinally stretched (at least 1.3 times); said substrate film can contain a small amount of filler particles, to form a laminate and stretching the laminate in the transverse direction (by at least 2.5 times). (See, Japanese Patent Pub-

lication No. 40794/71 and British Patent No. 1,268,823).

The coating of an aqueous dispersion of polymeric coating material in accordance with the present invention is carried out, at the latest, before the last stretching to which the resin film having filler particles incorporated therein composing the paperlike layer is subjected in practising the preparation process as stated above (hereinafter described in detail). The stretching procedure (*per se*, after the coating of an aqueous dispersion of the polymeric coating material and the drying of the coating is substantially similar to the aforementioned stretching.

In all cases, a variety of stretchable thermoplastic resins, in particular those which are capable of being molecularly orientated by stretching, may be used by themselves or in combination as the synthetic resin. Examples of such resins include for example,  $\alpha$ -olefin polymer resins such as homopolymers consisting essentially of ethylene (ethylene is hereinafter defined as an  $\alpha$ -olefin), propylene or butene-1, copolymers consisting essentially of these  $\alpha$ -olefins such as copolymers consisting essentially of ethylene and propylene, polyamide resins, polyester resins such as polyethylene terephthalate, polyvinyl or vinylidene resins such as homopolymers or copolymers of vinyl chloride or vinylidene chloride, homopolymers or copolymers of styrene. For the laminate structure, each layer may be composed of the same or different resins. The fillers are usually inorganic materials in a powder form. Examples of such inorganic materials include, for example, clay, talc, asbestos, gypsum, barium sulphate, calcium carbonate, titanium oxide, zinc oxide, magnesium oxide or diatomaceous earth, silicon oxide. Of course, these are in the form of powder, and the particle size of the powder is in the range of from 0.5 to 30 micron. The amount of the powder to be incorporated needs only be sufficient to develop papery properties upon stretching of the film to which the powder has been loaded. For the paperlike layer of the afore-mentioned laminate structure the amount usually is in the range of from 0.5 to 65% by weight and particularly from 5 to 60% by weight.

Polymers for the coating material are selected with regard to various standpoints.

According to the present invention, it is essential that the polymeric coating material should be extensible when it is dry because it is stretched together with the resin on which it is coated in preparing the paperlike layer. It is also preferred that the material should be mechanically and chemically stable from the standpoint of moldability, that it should be satisfactory in fixation of the paper dust, ink dryness, ink adhesion, ink trapping (for example, being less sensitive to water in offset

printing), stickiness, adhesion, gloss, colour tone and toxicity from the standpoint of quality as a coating material on the paperlike layer, and that it should be homogeneously blendable with the resin material of the synthetic paper and at the same time heat-resistant *per se*, since trimming loss cut off edges or inferior products may possibly be melted and shaped into film for re-use in the process of synthetic paper preparation.

Further, since the polymeric coating material is used as an aqueous dispersion or aqueous solution, then in the case where the material is used as an aqueous dispersion it should be able to be diluted with an aqueous solvent to such an extent that it may provide a coating dope having the required concentration, for example, from 5 to 30% by weight of the solution.

Examples of the water-soluble polymer which may be used as the polymeric coating material include: water-soluble homopolymers or copolymers (including, for example, partially hydrolyzed homopolymer) of acrylamide or each of the  $\alpha$ - and/or N-substituted derivatives thereof such as, for example, methacrylamide, N-methylolmethacrylamide, or N-methylolacrylamide; homopolymers or copolymers of alkyl acrylate or alkyl methacrylate, such as, for example, partially hydrolyzed product of polyalkylacrylate, in particular  $C_1$ — $C_4$  acrylate; homopolymers or copolymers of acrylic acid and methacrylic acid or the salts thereof, such as, for example alkali metal salts, ammonium salts or amine salts; homopolymers or copolymers of maleic acid or the salts thereof such as, for example, styrene-maleic acid copolymers; and partially hydrolyzed products of homopolymers or copolymers of vinyl esters such as vinyl acetate. Examples of water-insoluble polymers include those consisting of the above-mentioned monomeric species, such as, for example, homopolymers or copolymers of an alkyl acrylate, in particular a  $C_1$ — $C_4$  alkyl acrylate, or ethylene-vinyl acetate copolymers.

The especially preferred polymeric coating materials include  $C_1$ — $C_8$ , preferably  $C_2$ — $C_6$  alkyl acrylate homopolymers and copolymers, ethylene-vinyl acetate copolymers and polyethylene wax, all in an aqueous dispersion. Two different  $C_2$  to  $C_6$  alkyl acrylate copolymers are preferred in the coating.

The coating dope is an aqueous dispersion or an aqueous solution of the polymer as stated above.

As an aqueous solvent or an emulsifying medium, in addition to water by itself, a mixture of water and a water-soluble organic solvent such as, for example, an alcohol, e.g. methanol, and a ketone, e.g. acetone may also be used.

In addition to the polymeric coating material as an essential component and emulsifying agents which are preferably used in the case

of an aqueous emulsion, the aqueous solution may also contain for example another water-soluble or emulsifiable polymer, an acid, a base, a salt, a filler, a dye and pigment, a brightener, an antistatic agent, an ultraviolet ray absorbing agent, an ink drying agent, an ink transferring agent or an oil agent.

The concentration of the aqueous solution can be determined from the standpoint of the preparation of the solution and the coating workability. The concentration of the polymeric coating material is usually in the range of from 3 to 10% by weight, and preferably from 4 to 7% by weight of the dispersion.

As previously stated, the coating of the aqueous solution of the polymeric coating material in accordance with the present invention is carried out, at the latest, before the last stretching step to which the resin film having filler particles incorporated therein, composing the paperlike layer, is subjected in practising the process of producing the synthetic paper as mentioned above. For instance, in the case where the film in the form of a single layer which is uniaxially stretched, the coating is carried out before the last stretching step, usually the transverse stretching, and/or before the first stretching step, usually the longitudinal stretching. The same is true with the case where the film is in the form of a laminate structure. For example, in the case where the resin having filler particles incorporated therein is extruded onto at least one surface of the longitudinally-stretched film to form a laminate and the laminate is stretched in the transverse direction, the coating is carried out before the transverse stretching.

The stretching procedure after coating and drying of the aqueous polymeric coating material is substantially similar to that of the case of no coating.

Since, in accordance with the present invention the polymeric coating material is stretched together with the precursor of the paperlike layer, the adhesion developed between the polymeric coating material and the paperlike layer is satisfactory. However, in order to improve the wettability and adhesion of the paperlike layer to the aqueous solution or aqueous dispersion of the polymeric coating material or to remove the filler particles separated on or just before being separated from the surface of the paperlike layer to be coated it is generally preferably to subject the surface of the paperlike layer to appropriate pre-treatment.

As suitable pre-treatment methods there may be mentioned an electrical method such as a corona discharge treatment, a chemical method such as a flame treatment or a mechanical method such as a vacuum treatment.

The coating of the aqueous dispersion of the polymeric coating material may be conducted by any means which is resorted to in

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the art. For instance, there may be mentioned a means of contact type such as an air knife, a sizing press or a roll coater; and a means of non-contact type such as by a mist method or an electrostatic coating. The aqueous dispersion should be applied as uniformly as possible.

The amount of the dispersion or dope applied may optionally vary within the range in which the desired effects can be achieved. In general, the amount is from 1 to 8 g/m<sup>2</sup> (before stretching) or 0.1 to 3 g/m<sup>2</sup>, and preferably from 0.3 to 1 g/m<sup>2</sup> (after stretching) based on the polymeric coating material. With an amount below the lower limit the fixation of the paper dust is unsatisfactory, while with an amount above the upper limit there is a tendency for the excellent paper properties of the stretched film paperlike-layer of the resin having filler particles incorporated therein to deteriorate, which leads to the deterioration in properties of ink dryness, ink transference, and back trapping ability.

In the process for producing the synthetic paper as stated above, the lateral edges of the produced paper after stretching are generally cut off to provide the final product. Therefore, there is no need to spread the polymeric coating material over the full width of the sheet before stretching. Particularly when the stretching is carried out by, for example, a tenter method, the coating is desirably carried out so as not to cover the portions to be held by a tenter clip.

After coating, the sheet is dried and stretched to give a synthetic paper possessing improved continuous printability, especially offset continuous printability.

The advantages of the present invention will be illustrated by the experimental examples as shown below. It is not intended to limit the present invention to the following specific embodiments.

#### Example 1.

##### Production of the improved synthetic paper:

8% by weight of clay having a particle size of substantially 2 $\mu$ , 3% by weight of diatomaceous earth having a particle size of substantially 5 $\mu$  and 89% by weight of polypropylene are mixed with an antioxidant to prepare a composition, from which a sheet is produced and the sheet is stretched by five times (namely, the ratio of length after stretching/before stretching is 5) in the longitudinal direction. A composition consisting of 40% by weight of clay having a particle size of substantially 2 $\mu$  and 60% by weight of polypropylene is melt-extruded on both surfaces of the longitudinally stretched sheet through an extruder to produce a laminate sheet. The resulting laminate sheet is subjected to a corona discharge treatment at 50 W/m<sup>2</sup>min. A mixture of an aqueous emul-

sion (10% by weight solid content) of poly ethyl acrylate and a water-soluble amphoteric polymeric antistatic agent (1.5% by weight solid content) is applied on the treated sheet at a coverage of 4 g/m<sup>2</sup> of a solid content by means of a reverse roll coater, and the coated sheet is dried.

The coated laminate sheet is stretched by 7 times in the transverse direction, and is further subjected to a corona discharge treatment at 50 W/m<sup>2</sup>min.

#### Evaluation:

The film thus produced was found to have the following properties and to be a synthetic paper excellent in continuous offset printability.

Apparent density	0.78 g/cm <sup>3</sup>
Apparent porosity	30%
(surface layer 38%, substrate layer 22%)	
Whiteness	92%
Opacity	95%
Gloss	25%
Surface strength	great

Certain of the terms used above, and also used hereinafter, and other terms used herein-after have the following means:

#### Apparent porosity

$$\text{apparent porosity (\%)} = (\rho_0 - \rho) / \rho_0$$

$\rho_0$  = density of sheet before stretching.

$\rho$  = density of sheet after stretching.

#### Whiteness Unit %

Measured according to JIS (Japanese Industrial Standard) L1057.

#### Opacity Unit %

Measured according to JIS P8133.

#### Gloss Unit %

Measured according to JIS P8142.

#### Surface Strength

Judged from the configuration of the surface of synthetic paper after a piece of adhesive tape was affixed thereto and then removed.

#### Water Sensitivity

Judged by observing the aspect of ink trapping by conducting offset printing with a multi-colour offset printing machine.

#### Ink dryness

Time required to dry offset ink.

#### Reverse side transfer

Judged by observing the stain of ink on the reverse sides of about 500 sheets of paper laid on each other immediately after printing.

#### Waterproofness

Judged by the strength of adhesion of a film of polymeric coating material which has been coated on the surface of synthetic paper and dried.

#### Coverage.

The amount of coated material per m<sup>2</sup> of synthetic paper after drying.

The paper product was subjected to a printing test by means of a Model Dia II offset continuous printing machine (manufactured by Mitsubishi Heavy Industry Co.).

For comparison, a sheet which has been subjected to a corona discharge treatment at 50 W/m<sup>2</sup>min after stretching without applying the polymeric coating material and then coated with a 1.5% by weight aqueous solution of a water-soluble polymeric antistatic agent alone, was tested in the similar manner.

After 3,000 sheets of the present paper have been printed, it was found that the ink tack and the ink remains on the blanket (i.e. the rubber sheet of the offset press receiving the inked impression from the plate and trans-

fers it to the surface being printed) and the blanket whiteness were approximately similar to these before printing and the prints had almost unchanged from the beginning to the end.

Evaluation of the comparative paper after 500 sheets have been printed revealed a great change in the ink remains on the blanket as well as a change in the printed surface, and further printing was found to be difficult.

The evaluations as to other respects were as follows.

	Paper of the present invention	Comparative paper
Fixation of paper dust	above 3000 sheets	below 500 sheets
Water sensitivity (ink transference at the second roller)	◎ *	○ *
Ink dryness	4 HR	4 HR
Reverse side transfer	good	good
Surface resistivity	$4 \times 10^{10}$	$4 \times 10^{10}$

\* ◎ = very good

○ = good

#### Example 2.

A synthetic paper was prepared from an aqueous solution containing 10% by weight of poly (ammonium acrylate) having a molecular weight of 100,000 and 1.5% by weight of an amphoteric antistatic agent, by the same procedure described in Example 1.

A synthetic paper thus obtained, and a comparative paper which was subjected to a

corona discharge treatment at 50 W/m<sup>2</sup>min after the transverse stretching without pre-coating and then coated with said coating agent by means of a sizing press and dried, were printed by the Model Dia II printing machine and the printed papers were compared with each other.

The results are shown in the following table.

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	Pre-coating system (The present method)	Comparative paper
Fixation of paper dust	above 3000 sheets	above 3000 sheets
Ink transference	⊙ *	Δ *
Ink drying time	4 HR	4 HR
Surface resistivity	$5 \times 10^{10}$	$5 \times 10^{10}$
Surface strength	⊙ *	○ *
Gloss %	23	18
Waterproofness	○ *	X *
Feel	○ *	Δ *
Coverage, g/m <sup>2</sup>	0.4	0.4

\*Note.

\*⊙ = very good

Δ = slightly poor

○ = good

X = Poor

### Example 3.

Effect of coverage in g/m<sup>2</sup>:

5 Similar evaluations were carried out according to the same conditions as those described in Example 1 except that an aqueous emul-

sion of an ethyl acrylate-butyl acrylate copolymer as a coating agent is used in different coverages as indicated in the following table.

The results are shown below.

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Coverage g/m <sup>2</sup>	Fixation of paper dust	Texture	Ink drying HR	Gloss
0	X *	○ *	4	14
0.1	X *	○ *	4	17
0.2	Δ *	○ *	4	20
0.5	○ *	○ *	4	25
0.75	○ *	Δ *	5	30
1	○ *	Δ *	6	35
1.5	○ *	X *	8	40
3	○ *	X *	12	—

\*Note:

○ = good

Δ = slightly poor

X = poor



## WHAT WE CLAIM IS:—

1. A process for producing a synthetic paper comprising:
  - (a) coating the surface of a sheet comprising a layer of a plastics material having filler particles having a size of from 0.5 to 30 microns incorporated therein with an aqueous dispersion or solution of a dry-extensible polymeric coating material, said sheet comprising the plastics layer alone or a laminate of the plastics layer and at least one further layer of plastics;
  - (b) drying the coated sheet; and
  - (c) stretching said sheet in at least one direction to form an opaque paper-like structure.
2. A process for producing a synthetic paper as claimed in claim 1 in which the plastics material is an  $\alpha$ -olefin polymer resin.
3. A process for producing a synthetic paper as claimed in claim 2 in which the  $\alpha$ -olefin polymer resin is a homopolymer consisting essentially of ethylene, a homopolymer consisting essentially of propylene or a copolymer consisting essentially of ethylene and propylene.
4. A process for producing a synthetic paper as claimed in any of claims 1 to 3 in which the aqueous dispersion is an aqueous emulsion.
5. A process for producing the synthetic paper as claimed in any of claims 1 to 4 in which the dry-extensible polymeric coating material is soluble in water and is selected from the group consisting of homopolymers and copolymers of acrylamide, methacrylamide, N-methylolacrylamide, N-methylol methacrylamide, acrylic acid, methacrylic acid, ammonium acrylate, ammonium methacrylate, an alkali metal acrylate, an alkali metal methacrylate, a  $C_1$ — $C_4$  alkyl acrylate and a  $C_1$ — $C_4$  alkyl methacrylate.
6. A process for producing a synthetic paper as claimed in claim 5 in which the dry-extensible polymeric coating material is a partially hydrolysed homopolymer of acrylamide, or a partially hydrolysed homopolymer of a  $C_1$ — $C_4$  alkyl acrylate.
7. A process for producing the synthetic paper as claimed in claims 1 to 4 in which the dry-extensible polymeric coating material is soluble in water and is selected from the group consisting of a homopolymer and copolymer of maleic acid or a water-soluble salt thereof.
8. A process for producing a synthetic paper as claimed in claim 1 in which the dry-extensible polymeric coating material is insoluble in water and is selected from the group consisting of a homopolymer and copolymer of alkyl acrylate or an alkyl methacrylate.
9. A process for producing a synthetic paper as claimed in claim 8 in which the alkyl group contains 1 to 8 carbon atoms.
10. A process for producing a synthetic paper as claimed in claim 8 in which the dry-extensible, polymeric coating material comprises two different copolymers of a  $C_1$  to  $C_8$  alkyl acrylate.
11. A process for producing a synthetic paper as claimed in claim 1 in which the dry-extensible polymeric material is an ethylene-vinyl acetate copolymer.
12. A process for producing a synthetic paper as claimed in claim 1 in which the dry-extensible, polymeric coating material is a polyethylene wax.
13. A process for producing the synthetic paper as claimed in claim 5 in which the dry-extensible polymeric coating material is poly ammonium acrylate.
14. A process as claimed in any of claims 1 to 13, in which the concentration of the polymeric coating material is from 3 to 10% by weight.
15. A process as claimed in any of claims 1 to 14, in which the amount of the aqueous dispersion applied to the sheet is from 1 to 8 g/m<sup>2</sup> based on the polymeric coating material.
16. A process as claimed in claim 1, substantially as herein described with reference to any of the specific Examples.
17. A synthetic paper when produced by a process as claimed in any of claims 7 to 17.

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**AN - 1980-00626C [01]**

**A - [001] 011 04- 041 046 047 050 052 07& 08- 09& 10- 15- 229 305 364 365  
435 442 477 516 517 523 575 596 658 688**

**- [002] 011 034 04- 041 046 047 07& 08- 09& 10- 15- 229 305 364 365 435  
442 477 516 517 523 575 596 658**

**CPY - MITY**

**DC - A89 G06 P83**

**FS - CPI;GMPI**

**IC - G03C1/68**

**KS - 0072 0183 0205 0231 0232 0239 0240 0248 0262 2208 2321 2588 2595 2654  
2725 2804**

**MC - A04-G01E A12-B03A A12-L01 G06-B01 G06-B02**

**PA - (MITY ) MITSUBISHI PAPER MILLS LTD**

**PN - JP54147033 A 19791116 DW198001 000pp**

**PR - JP19780055177 19780510**

**XIC - G03C-001/68**

**AB - J54147033 Coated paper is obtd. by providing a polyolefin resin layer  
contg. white inorganic pigment, and having opacity of 60-85% on one  
side (to which photographic emulsions are to be applied) of a coloured  
paper base. Pref. the coloured paper base is prepd. by coating  
coloured pigment on a paper base using the size pressing technique at  
a coverage of 0.003-0.78 g/m<sup>2</sup>. Prod. has improved visual whiteness.**

**- Polyolefin resin is e.g. polyethylene, polypropylene, polyisobutylene  
or copolymer contg. ethylene as main component. The white inorganic  
pigment is e.g. titanium oxide, zinc white clay or kaolin. Pref.  
content of such pigment is 7-12 pts. wt. per 100 pts. wt. of  
polyolefin resin compsn. Coloured pigment used for colouring the  
paper base is e.g. Violet B.B., Astra Blue 3R, Paper Blue S or Paper  
Red 4B. Pref. thickness of the polyolefin layer is 20-40 mu.**

**IW - POLYOLEFIN COATING PHOTOGRAPH PAPER PRODUCE APPLY POLYOLEFIN RESIN  
LAYER CONTAIN WHITE INORGANIC PIGMENT COLOUR PAPER BASE**

**IKW - POLYOLEFIN COATING PHOTOGRAPH PAPER PRODUCE APPLY POLYOLEFIN RESIN  
LAYER CONTAIN WHITE INORGANIC PIGMENT COLOUR PAPER BASE**

**NC - 001**

**OPD - 1978-05-10**

**ORD - 1979-11-16**

**PAW - (MITY ) MITSUBISHI PAPER MILLS LTD**

**TI - Polyolefin-coated photographic paper prodn. - by applying polyolefin  
resin layer contg. white inorganic pigment to coloured paper base**

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